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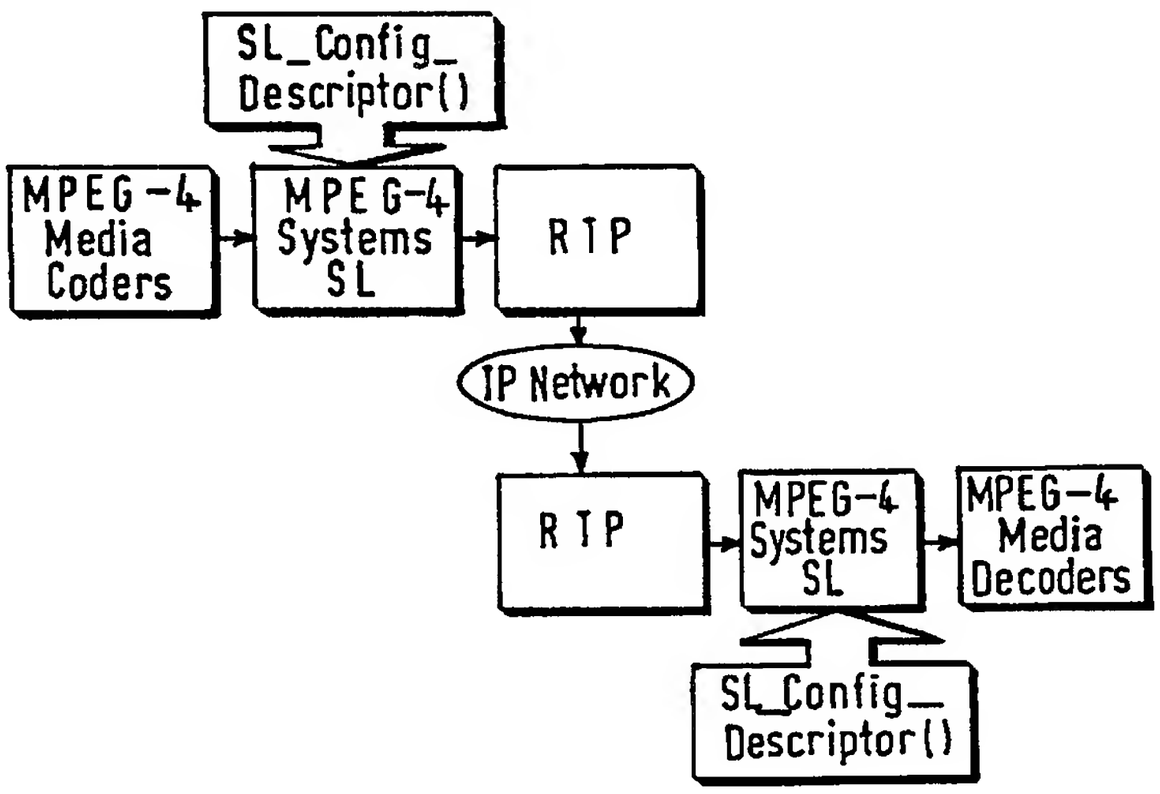

(57) Abstract

The invention relates to a preprocessing method for adapting digital data streams such as MPEG–4 ones to the so–called real time protocol (RTP) used by the "Internet" network. A synchronization layer SL being the interface defined between MPEG–4 media layers and the RTP stack, a reduced SL header format is specified in order to fit to the RTP header. Considering that the RTP header fields that are common to the SL header specifications are: padding, marker, sequence number, and time stamp, the semantic of the RTP fields according to the MPEG–4 SL data that are carried in the packets is redefined.

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Preprocessing method for adapting MPEG-4 data streams to the internet network.

The present invention relates to a preprocessing method for adapting digital data streams such as MPEG-4 ones to the so-called real time protocol (RTP) used by the "Internet" network.

Multimedia streaming over the internet network is now a daily reality. Services related to this domain are numerous : electronic commerce, interactive games, video on demand, on so on. MPEG-4, described for instance in "Overview of the MPEG-4 Version 1 Standard", ISO/IEC-JTC1/SC29/WG11-N1909, October 1997, and in "MPEG-4 Systems", ISO/IEC-JTC1/SC29/WG11-N1901, November 1997, is a standard for the coding of natural and synthetic audio-visual data in the form of audiovisual objects that are arranged into an audiovisual scene by means of a scene description. The advantages of this MPEG-4 standard in the context of the Internet network are various (excellent picture quality at low bitrates, high interactivity possibilities, ability to mix bi- and tri-dimensional representations,...).

The protocol RTP is adapted to the transmission of multimedia data, especially data that have real-time constrains such as audio or video. MPEG has also defined an interface to underling network technologies : the Synchronisation Layer (SL). However, direct mapping from SL-packets to RTP packets is not easy, mainly due to the difference of complexity between the two formats.

It is therefore the object of the invention to propose a very simple way to adapt SL-packet to RTP packets by selecting in the SL-header the information that can be used by the RTP protocol.

To this end the invention relates to a preprocessing method such as defined in the introduction of the description and which is moreover characterized in that, a synchronization layer SL being the interface defined between MPEG-4 media layers and the RTP stack, a reduced SL header format is specified in order to fit to the RTP header.

The invention will now be described in a more detailed manner, with reference to the accompanying drawings in which :

Fig.1 shows a header for an RTP data packet ;

Fig.2 illustrates the protocol stack for using MPEG-4 over RTP structure.

According to the general RTP specification, RTP data packets consist of a 12-byte fixed header (see Fig.1). This header is followed by a variable optional part and the payload (video frames, audio samples). On the other hand, the MPEG-4 SL packet header format can be found in MPEG-4 specifications. If one considers an MPEG-4 implementation for IP networks, the system structure can be presented as indicated in Fig.2. The SL layer is the interface between MPEG-4 media layers and the RTP stack. Then, the SL layer has to be configured to convey properly the SL information through the network. Different propositions have already been made. What is proposed here is to specify a reduced SL header format that will fit to the RTP header.

The RTP header fields that can be common to the SL header specifications are :

a) Padding (1)
b) Marker (1)
c) Sequence Number (16)
d) Time Stamp (32)

Then, using the fields that are common in RTP and SL headers as mentioned above, and regarding the protocol stack of Fig.2, the semantic would be as in Table 1, giving the semantic structure for SL/RTP mapping :

Comment	RTP Header Field	SL-packet Header Field	SL_Config_descriptor Field	Semantic
RTP allows to transmit padding information to align payload to data blocks. MPEG-4 padding is designed for byte alignment or to transmit padding bytes only.	Padding (1)	-PaddingFlag PaddingBits = 0	UsePaddingFlag =1	The use of Padding should be restricted to the transmission of padding bytes only
The RTP marker is used for delimiting frames boundaries. This bit could by mapped in MPEG-4 terminology to the start or the end of an Access unit or a Random Access Point.	Marker (1)	AccessUnitStartFlag	Use AccessUnitStartFlag = 1	The Marker should correspond to the accessUnitStartFlag since, in the SL, timestamp and sequence number are assigned to AU and not packets. It is needed to mark the start of an AU.
In both RTP and SL specifications the sequence number is used for re-ordering purpose and packet loss detection.	Sequence Number (16)	PacketSeqNum	PacketSeqNumLength =16	The length of the sequence number should be limited to 16 bits to fit RTP requirements.
Only one timestamp is conveyed in RTP while decoding, and composition timestamps are possible in the SL.	TimeStamp (32)	DecodingTimeStamp Composition Timestamp	UseTimeStampFlag = 1 TimeStampResolution TimeStampLength = 16	To be able to transport both SL timestamps, the RTP timestamp (coded on 32 bits) should be split in two parts to be able to map SL decoding and composition timestamps (that should be coded on 16 bits)

This very simple and efficient way to map MPEG-4 SL packets to RTP packets is based on the fact that one has defined a SL_Config_Descriptor structure that forces to reduce the SL header to what values can be stored in RTP header fields, thus defining the semantic of the RTP fields according to the MPEG-4 SL data that are carried in the packets :

a) Padding flag will mean that the packet is only made of padding data ;
b) Marker bit is indicating the start of an Access Unit ;
c) Sequence Number is coded on 16 bits to respect RTP header specification and according to MPEG-4 that allows variable length of the SL fields ;
d) Time Stamp field of the RTP packet conveys the two SL header time stamps (decoding and compositions). Each SL time stamp is coded on 16 bits and concatenated to form the TimeStamp of RTP which is coded on 32 bits.

What is additional, in the case of the present invention, is the need for the definition of an RTP payload type to refer to MPEG-4 streams (as usual for other data types to be transported by RTP). To preserve SL full header, the optional "extension fields" of the RTP header could be used to carry the information that are not present in the classic RTP header, with a main drawback : overhead bytes.

CLAIMS:

1. A preprocessing method for adapting digital data streams such as MPEG-4 ones to the so-called real time protocol (RTP) used by the "Internet" network, wherein, a synchronization layer SL being the interface defined between MPEG-4 media layers and the RTP stack, a reduced SL header format is specified in order to fit to the RTP header.

2. A method according to claim 1, wherein the RTP header fields that are common to the SL header specifications are : padding, marker, sequence number, and time stamp.

3. A method according to claim 2, wherein the semantic of the RTP fields according to the MPEG-4 SL data that are carried in the packets is defined as follows :

a) Padding flag means that the packet is only made of padding data ;
b) Marker bit is indicating the start of an Access Unit ;
c) Sequence Number is coded on 16 bits in order to respect RTP header specification and according to MPEG-4 that allows variable length of the SL fields ;
d) Time Stamp field of the RTP packet conveys the two SL header time stamps "decoding" and "compositions", each SL time stamp being coded on 16 bits and concatenated to form the TimeStamp of RTP which is coded on 32 bits.

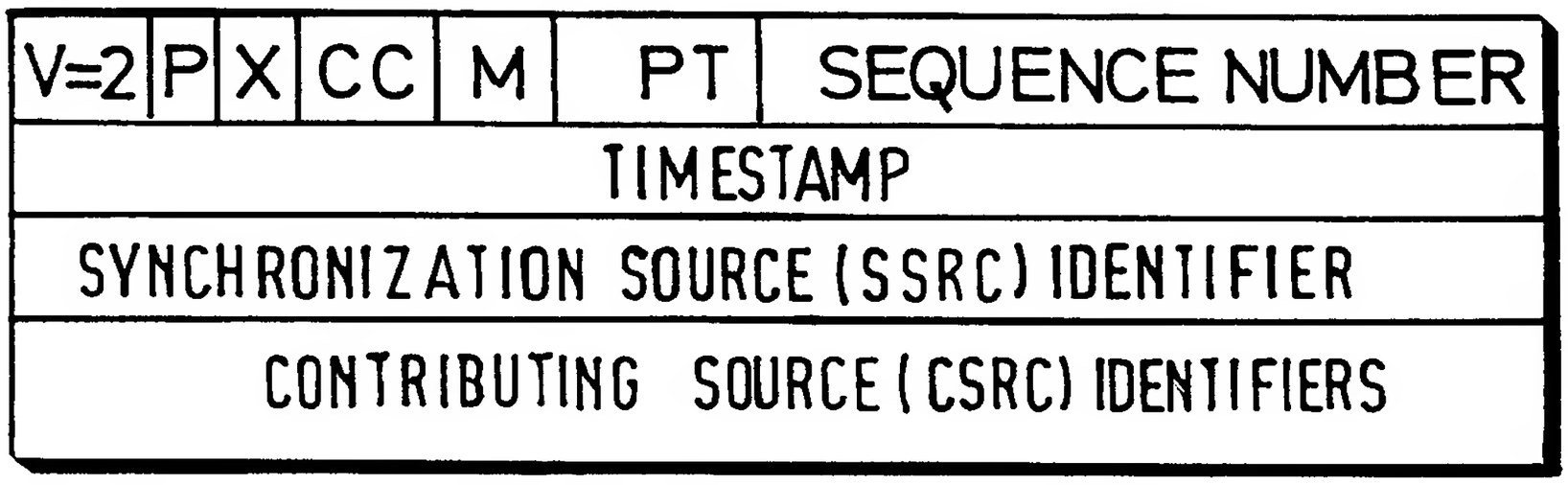
V=2
P
X
CC
M
PT
SEQUENCE NUMBER
TIMESTAMP
SYNCHRONIZATION SOURCE (SSRC) IDENTIFIER
CONTRIBUTING SOURCE (CSRC) IDENTIFIERS

FIG.1

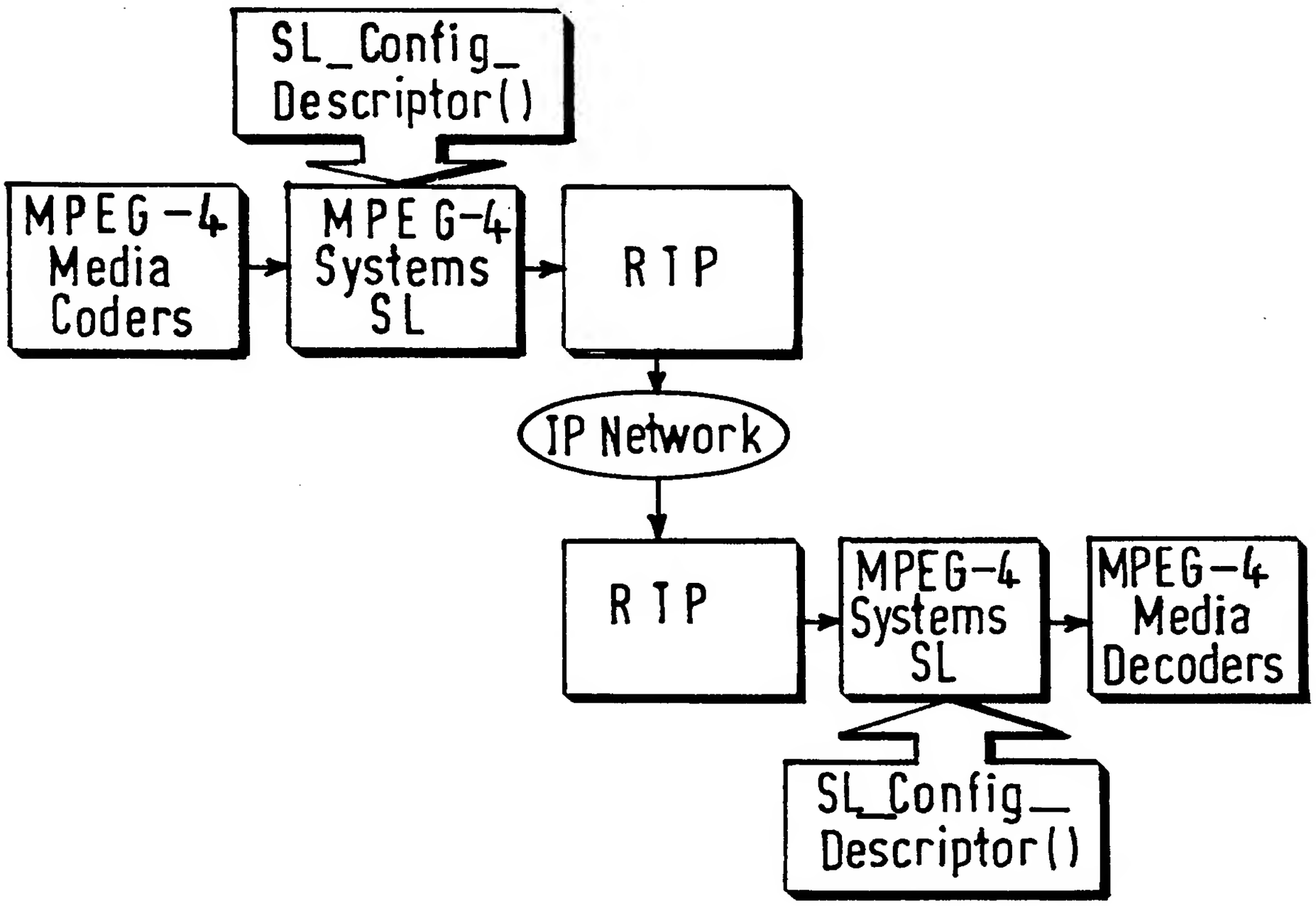
SL_Config_ Descriptor()
MPEG-4 Media Coders
MPEG-4 Systems SL
RTP
IP Network
RTP
MPEG-4 Systems SL
MPEG-4 Media Decoders
SL_Config_ Descriptor()

FIG.2

INTERNATIONAL SEARCH REPORT

Inter ›nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
INSPEC, COMPENDEX, EPO-Internal, IBM-TDB, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	BASSO A ET AL: "Real-time MPEG-2 delivery based on RTP: Implementation issues" SIGNAL PROCESSING. IMAGE COMMUNICATION,NL,ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, vol. 15, no. 1-2, September 1999 (1999-09), pages 165-178, XP004180643 ISSN: 0923-5965 paragraph '02.1! paragraph '02.3! figure 1 --- -/--	1-3

[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
4 August 2000	18/08/2000

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Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
P,A	BERTOGLIO L ET AL: "Intermedia synchronization for videoconference over IP" SIGNAL PROCESSING. IMAGE COMMUNICATION,NL,ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, vol. 15, no. 1-2, September 1999 (1999-09), pages 149-164, XP004180642 ISSN: 0923-5965 paragraph '2.1.2! ---	1-3
A	ISHIBASHI Y ET AL: "EFFECTS OF TRANSPORT PROTOCOLS ON MEDIA SYNCHRONIZATION QUALITY" IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE,US,NEW YORK, NY: IEEE, 1998, pages 720-727, XP000825852 ISBN: 0-7803-4985-7 paragraph '0003! ---	1-3
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information on patent family members

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